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(71) Applicants
Avon Industrial Polymers Limited (United Kingdom)
Bath Road, Melksham, Wiltshire, SN12 8AA

(72) Inventors
David Boast
Roger William Head

(74) Agent and/or Address for Service
Mewburn Ellis & Co., 2/3 Cursitor Street, London, EC4A 1BQ

(54) Milk liner claw tube protector

(57) A milk liner claw tube protector 6 consists of a flexible sleeve 7 which fits over the end of a claw tube 3 which receives a claw nipple 1. The sleeve 7 has ribs 11 which extend inwardly towards the tube 3 so that an air pocket 10 is defined between the sleeve 7 and the claw tube 3. When the claw tube 3 bends, the sleeve also bends, but the ribs 11 maintain a gap between them. Therefore, even if an impact occurs when the tube 3 is bent, there will be absorption of the impact by the ribs 11 thereby reducing the risk of damage to the claw tube. One end 9 of the sleeve 7 seals to the claw tube and the other end 8 seals to the claw nipple 1 as this arrangement is easier to assemble than if the sleeve 7 fits completely over the claw tube 3.

Fig. 3.

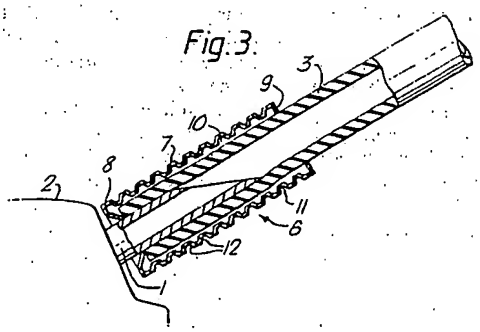

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Fig. 1.

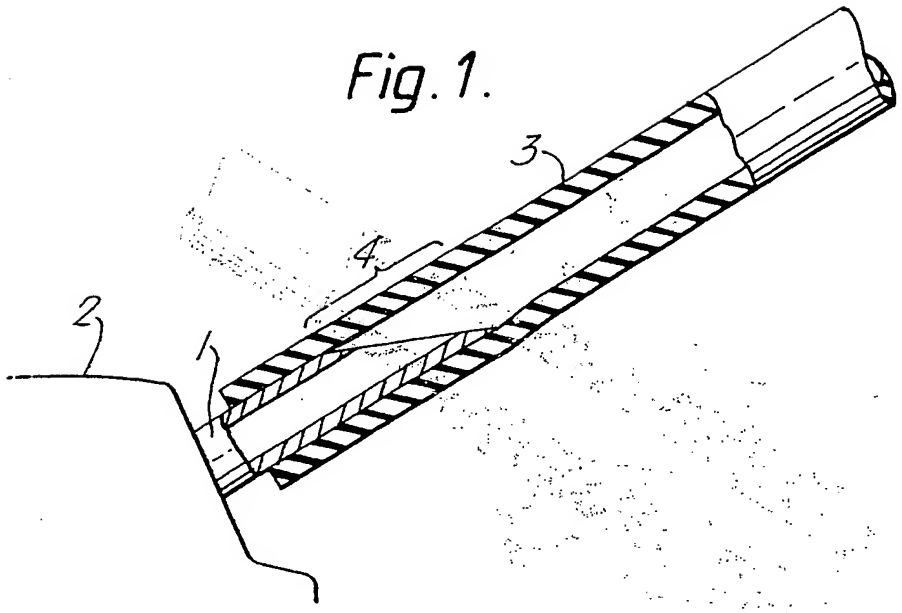


Fig. 2.

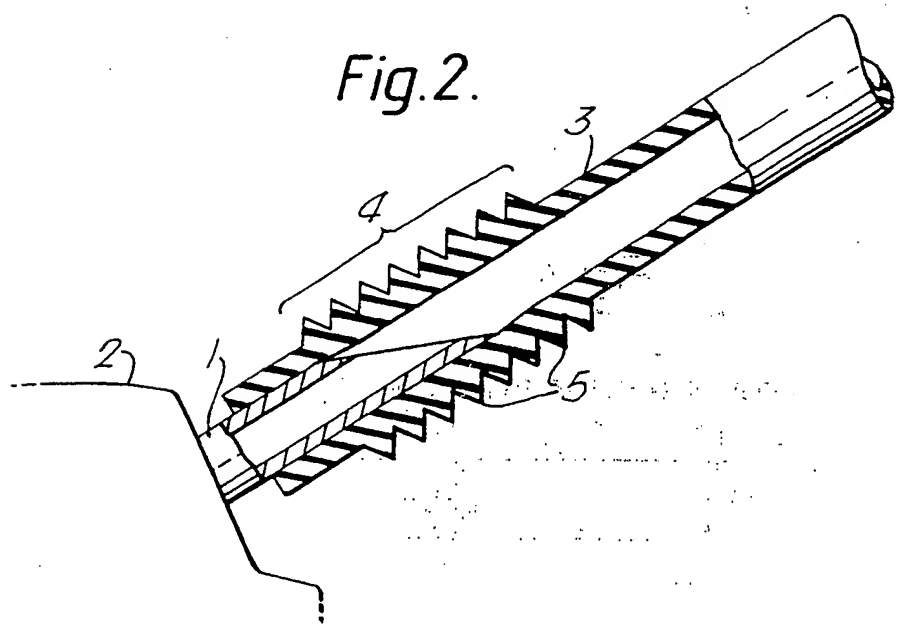


Fig.3.

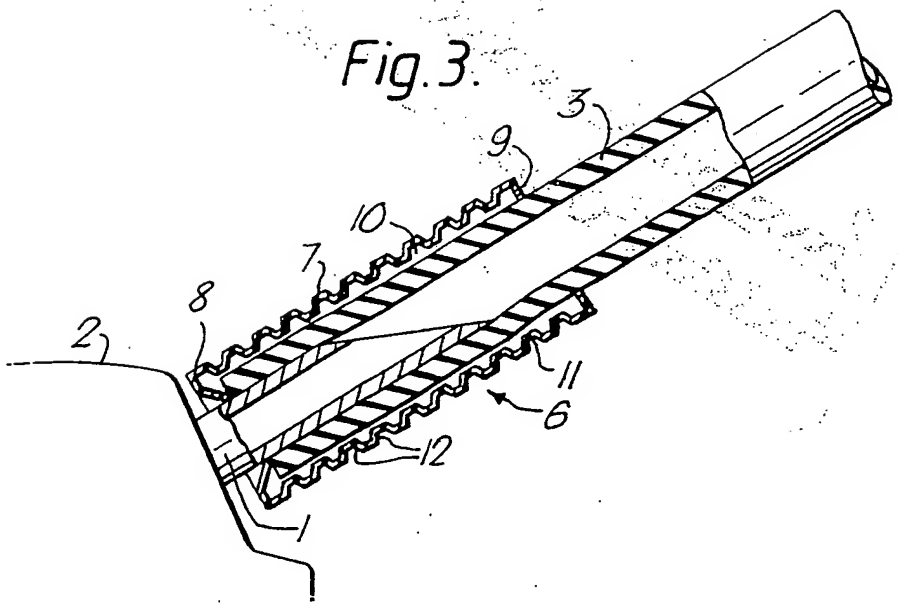
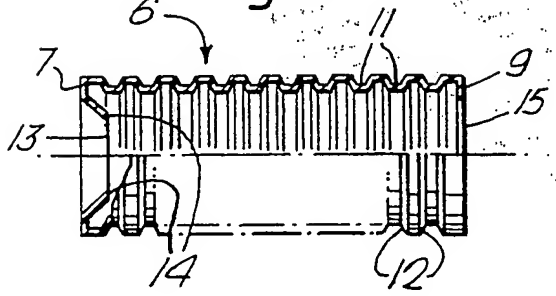


Fig.4.



SPECIFICATION

Milk liner claw tube protector

The present invention relates to a protector for protecting the claw tube of a milk liner of a milking machine against damage due to impact.

In a milking machine teat cups are provided which are fitted over the teats of the cow's udder. Each teat cup comprises a metal body containing a flexible liner, the liner being connected to a cluster common to a group of four teat cups by a flexible tube known as a claw tube. The claw tube may be integral with the part of the liner in the teat cup and fits over a claw nipple projecting from the cluster. Alternatively, the claw tube may be a separate piece which is connected to the part of the liner in the teat cup.

Figure 1 of the accompanying drawings shows a cross-sectional view of a liner claw tube fitted over a claw nipple. As shown in that figure, a claw nipple 1 projects from a cluster 2 and a claw tube 3 of a milk liner fits over the nipple 1. The end of the nipple 1 is inclined relative to the axis of the nipple 1. When the teat cup (not shown) at the free end of the claw tube is removed from a cow's udder the weight of the teat cup bends the claw 3 downwards on the nipple 1 and the portion 4 of the claw tube adjacent and above the free end of the nipple 1 folds over the end of the nipple 1 to seal it. The closure of the nipple 1 prevents loss of vacuum pressure in the pipe run leading to the cluster 2 and also prevents loss of milk from the open milk liner.

A major problem with this arrangement is that the part 4 of the claw tube 3 adjacent the free end of the nipple 1 is extremely susceptible to damage due to impact. In certain circumstances the cluster itself may be damaged. It is not uncommon for the cow to kick or tread on the claw tube 3 and the usual point of fracture is adjacent the free end of the nipple 1 because the end of the nipple 1 may cut the claw tube at that point. Another cause of fracture is impact of the claw tube 3 against a stanchion or wall when the cluster 2 is withdrawn from the milking station by automatic retraction equipment. The use of such automatic retraction equipment is becoming increasingly common and the problems of impact damage become more important.

Figure 2 of the accompanying drawings shows a claw tube modified to protect it against impact damage. A plurality of ribs 5 are provided on the claw tube 3 around the part 4 of that tube 3 adjacent the free end of the nipple 1. Several different configurations of ribs are known. Figure 2 illustrates a configuration with annular ribs 5 around the claw tube 3 but it is also known to provide ribs which extend along the claw tube 3. It is also known to thicken the material of the claw tube 3 at its part 4. All these configurations seek to cushion the claw tube 3 from impact. However, they have a major drawback; they decrease the flexibility of the claw tube 3 adjacent the free end of the nipple 1. This reduction in flexibility prevents the claw tube 3 from bending sufficiently to seal the free end of the nipple 1 thereby causing loss of pressure and/or loss of milk.

The present invention seeks to provide protection for the claw tube of a milk liner. In essence, the present invention proposes a protector for a claw tube in the form of a flexible sleeve which fits over at least a part of the claw tube adjacent the end of the claw tube for receiving a claw nipple. The sleeve and the claw tube thus provide a claw tube assembly with the sleeve resisting impact damage to the claw tube.

As discussed above, one problem with forming a protector integral with the claw tube is that it decreases the flexibility of the claw tube. For this reason it is preferable that the sleeve is more flexible than the claw tube. One way of achieving flexibility, yet maintaining protection from impacts is to provide at least one gas (usually air) pocket defined by the sleeve. The gas pocket permits relative movement of parts of the sleeve and the claw tube. A plurality of pockets may be provided, indeed the use of sponge rubber which has a multiplicity of pockets would provide adequate protection. However, it is preferable that the gas pocket is between the sleeve and the claw tube.

If the gas pocket closed completely during bending of the claw tube, the protection afforded by the sleeve would be reduced as shocks would be transmitted directly from the sleeve to the claw tube. To prevent this it is preferable that means are provided for preventing complete closure of the gas pocket, and a suitable way of doing this is to provide inwardly projecting ribs which abut against the outer surface of the claw tube during deformation of the sleeve. The resilience of the ribs to deformation then absorbs impacts to the sleeve. The ribs preferably extend circumferentially around the sleeve, although it is possible for the ribs to have a shorter extent, so that they form these projections.

It is possible for the sleeve simply to fit over the claw tube, however, particularly when there is a gap between part of the inner surface of the sleeve and the claw tube, a problem arises in passing the tube through both ends of the sleeve. Therefore it is possible to design the sleeve so that only one end seals to the claw tube and the other end seals directly to the claw nipple. Then it is unnecessary for the end of the claw tube to pass completely through the sleeve, and also means that the end of the sleeve may be trapped between the end of the claw tube and the cluster to prevent axial movement of the sleeve.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figures 1 and 2 show known claw tubes for a milk liner and have already been described;

Figure 3 shows a sectional view through a claw tube fitted with a protective sleeve according to the present invention; and

Figure 4 shows the protective sleeve of Figure 3 in more detail.

In Figure 3 a claw tube 3 is fitted over a claw nipple 1 of a milking cluster 2 as in Figure 1. The protector 6

according to the present invention comprises a ribbed sleeve 7, one end 8 of which is fitted over the claw nipple 1 with the sleeve 7 extending along the claw tube 3 to cover the part of the claw tube 3 covering the free end of the nipple 1. The sleeve 7 terminates in a seal 9 around the claw tube 3. The sleeve 7 of the protector 6 has inwardly projecting ribs 11 extending circumferentially around the sleeve so that an air pocket 10 is formed between the inner surface of the sleeve 7 and the outer surface of the claw tube 3. The radial walls of each rib may be sloped towards each other outwardly as shown in Figs. 3 and 4 or may be parallel with each other according to the impact absorption and flexibility required. When an object hits the sleeve 7 the air in the pocket 10 provides an initial cushioning effect, reducing the force of the impact. Then the inwardly projecting ribs 11 on the sleeve 7 abut against the claw tube 3 and the walls 12 of the ribs 11 resist further deformation of the sleeve 7 thereby eliminating or at least ameliorating, the effect of an impact on the claw tube 3.

When the claw tube 3 bends downwards in Fgure 3 due to the weight of a teat cup, the upper part of the sleeve 7 expands and the lower part contracts axially of the claw tube 3. This 'concertina" effect due to the shape of the ribs 11 renders the sleeve 7 extremely flexible so that it does not offer significant resistance to bending of the claw tube. The ribbed construction of the sleeve 7 thus combines energy absorbing properties with flexibility.

To fit the sleeve 7, the claw nipple 1 is fitted through an aperture 13 (Fig. 4) at the end 8 of the sleeve 7 and a flange 14 at that end 8 seals the sleeve 7 to the claw nipple. Then, the claw tube 3 is slid into the aperture 15 on the seal 9 until the free end of the claw tube 3 is fitted onto the claw nipple 1. The end 8 of the sleeve 7 is then trapped between the free end of the claw tube 3 and the cluster 2 thereby preventing axial movement of the sleeve 7.

The sleeve 7 is preferably made of an impact resistant flexible plastics or elastomeric material such as a thermosetting synthetic rubber. It has been found that 3 mm deep ribs on the sleeve 7 provide sufficient cushioning and sufficient flexibility for standard claw tubes. It may be made in a colour different from the claw tube thereby drawing attention to the vulnerable area of that tube.

Many other designs of sleeve are possible, and still retain the advantages of the present invention. For example, it is possible to have a plurality of air pockets or even use a sponge rubber sleeve, which has a multiplicity of pockets. Alternatively the sleeve could have a plurality of radial flanges or other projections extending outwardly of the sleeve so that an object strikes the flanges which deform to absorb the impact.

CLAIMS

1. A claw tube assembly having a claw tube and a separable flexible sleeve fitting over at least a part of the claw tube adjacent the end of the claw tube for receiving a claw nipple, the sleeve being adapted to resist impact damage to the claw tube.

2. An assembly according to claim 1, wherein the sleeve is more flexible than the claw tube.

3. An assembly according to claim 1 or claim 2, wherein the sleeve defines at least one gas pocket adjacent the claw tube to facilitate deformation of the sleeve.

4. An assembly according to claim 3, wherein the or each gas socket is defined between a part of the inner surface of the sleeve and the outer surface of the claw tube.

5. An assembly according to claim 4, wherein the sleeve has a plurality of inwardly projecting ribs adapted to abut against the outer surface of the claw tube during deformation of the sleeve and thereby prevent complete closure of the gas pocket.

6. An assembly according to claim 5, wherein the ribs extend circumferentially around the sleeve.

7. An assembly according to claim 3 wherein the sleeve is made of sponge rubber.

8. An assembly according to claim 1 or claim 2, wherein the sleeve has projections extending in the radial direction away from the claw tube.

9. An assembly according to any one of the preceding claims wherein at least one end of the sleeve is sealed to the claw tube.

10. An assembly according to claim 9 wherein the end of the sleeve furthest from the end of the claw tube for receiving a claw nipple is sealed to the claw tube, and the other end of the sleeve has a flange adapted to seal that end of the sleeve to a claw nipple.

11. A claw tube assembly substantially as herein described with reference to and as illustrated in Figs. 3 and 4 of the accompanying drawings.

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